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But by (1), c_4 is the intersection of a_3m_{12} , a_1m_{23} , or the incenter of $a_1a_2a_3$. Therefore c_i as defined above is identical with the incenter of the triangle formed by omitting a_i , and the problem is proved.

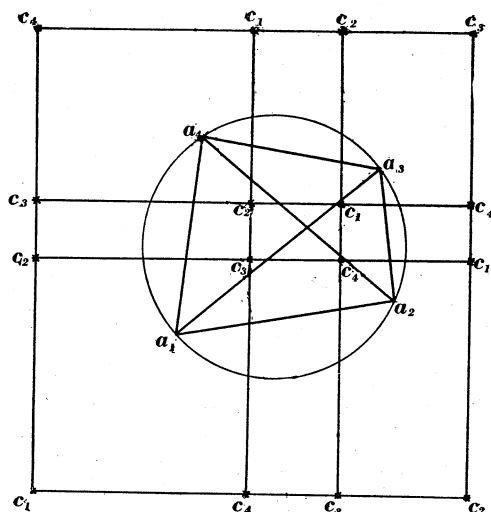


FIG. 2.

The extension suggested to be proved by analogous methods is shown in Fig. 2, where the four incenters and twelve excenters, of the four triangles formed by omitting a_i in turn, are the intersections of two sets of four perpendicular lines.

Also solved by O. J. RAMLER, R. A. JOHNSON, J. E. ROWE, J. W. CLAWSON, and PAUL CAPRON.

CALCULUS.

409. Proposed by B. J. BROWN, Victor, Colorado.

Integrate the differential equation,

$$\frac{\partial^2 z}{\partial x \partial y} + \frac{1}{x+y} \left(\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} \right) - \frac{2}{(x+y)^2} z = 0.$$

II. SOLUTION BY W. W. BEMAN, Ann Arbor, Michigan.

This problem is found in Gregory's *Examples* and Forsyth's *Treatise on Differential Equations*. Gregory puts

$$y + x = u, \quad y - x = v$$

and makes use of the solution of a previous problem.

Maser in the German translation of Forsyth's *Treatise* puts

$$z = \frac{u}{(x+y)^2} \text{ and writes the new equation } (x+y) \frac{\partial^2 u}{\partial x \partial y} = \frac{\partial u}{\partial x} + \frac{\partial u}{\partial y}.$$

Differentiating with respect to x , he gets

$$(x+y) \frac{\partial^3 u}{\partial x^2 \partial y} = \frac{\partial^2 u}{\partial x^2}, \text{ and from this } \frac{\partial^2 u}{\partial x^2} = (x+y) \phi'''(x).$$

Integrating twice with respect to x , he obtains u and finally z as in Mr. Adams's solution' on p. 129 of the March, 1917, MONTHLY. It may be observed that in Mr. Adams's solution

$$w = \frac{\partial^2 u}{\partial x^2}.$$